1. A magnetic memory comprising:

a plurality of bit lines;

a plurality of word lines crossing the bit lines;

a plurality of magnetic memory elements disposed at intersections of the bit lines and the word lines, each of the memory cells comprising a free layer with reversible magnetization and a pinned layer with fixed magnetization;

a reference potential generating circuit configured to generate a predetermined reference potential;

a write bit line current controlling circuit configured to control write bit line current passing through the bit lines in a write operation on the basis of a reference potential generated by the reference potential generating means; and

a write word line current controlling circuit configured to control write word line current passing through the word lines in the write operation on the basis of a reference potential generated by the reference potential generating circuit.

2. The magnetic memory of Claim 1, wherein

the write bit line current controlling circuit includes a first transistor having a gate for receiving the reference potential to pass the write bit line current, and

the write word line current controlling circuit includes a second transistor having a gate for receiving the reference potential to pass the write word line current.

3. The magnetic memory of Claim 3, wherein

a ratio of a channel width/channel length of the first transistor to a channel width/channel length of the second transistor is set to be substantially equal to a ratio of the write bit line current to the write word line current.

4. The magnetic memory of Claim 1, wherein the write bit line current is optimized.

5. The magnetic memory of Claim 1, wherein the write bit line current is optimized by:

determining a distance r_B from the bit lines to the free layers, a distance r_W from the word lines to the free layers, and a number n of the bit lines through which write bit line current I_B passes in a write operation; and

determining the write bit line current I_B and the write word line current I_W so as to minimize the write current I_T by using expression (1) representing an asteroid curve expressed by a bit line magnetic field H_x generated by the bit line current I_B, a word line magnetic field H_y generated by the write word line current I_W passing through the word lines in the write operation, and a predetermined constant H_K, expression (2) representing write current I_T obtained by adding the write bit line current I_B and the write word line current I_W, expression (3) representing the bit line magnetic field H_x generated by the bit line current I_B by using a predetermined coefficient a, and expression (4) representing the word line magnetic field H_y generated by the word line current I_W by using the predetermined coefficient a:

$$H_x^{\frac{2}{3}}+H_y^{\frac{2}{3}}=H_k^{\frac{2}{3}} \quad (1)$$

$$I_T=n\ I_B+I_W \quad (2)$$

$$H_x=a\frac{I_B}{r_B} \quad (3)$$

$$H_y=a\frac{I_W}{r_W} \quad (4)$$

6. The magnetic memory of Claim 5, wherein the constant H_K is given by expression (5) using a predetermined design margin m_1 when a minimum bit line magnetic field that makes it possible to reverse the magnetization of the free layers in any one of the memory cells associated with the bit line through which the write bit line current I_B passes when $H_y = 0$ or a minimum word line magnetic field that makes it possible to reverse the magnetization of the free layers in any one of the memory cells associated with a word line through which the write word line current I_W passes when $H_x = 0$ is denoted as H_U:

$H_K = H_U + m_1$ (5)

7. The magnetic memory of Claim 6, wherein the constant H_K is given by expression (5) using a predetermined design margin m_1 when a minimum bit line magnetic field that makes it possible to reverse the magnetization of the free layers in any one of the memory cells associated with the bit line through which the write bit line current I_B passes when $H_y = 0$ or a minimum word line magnetic field that makes it possible to reverse the magnetization of the free layers in any one of the memory cells associated with a word line through which the write word line current I_W passes when $H_x = 0$ is denoted as H_U:

$H_K = H_U + m_1$ (5)

8. The magnetic memory of claim 7, wherein the bit line magnetic field H_x and the word line magnetic field H_y are given by expressions (6) and (7) using predetermined design margins m_2 and m_3, respectively, when a maximum bit line magnetic field that makes it impossible to reverse the magnetization of the free layers in any one of the memory cells when $H_y = 0$ or a maximum word line magnetic field that makes it impossible to reverse the magnetization of the free layers in any one of the memory cells when $H_x = 0$ is denoted as H_L where:

$$|H_y| \leqq H_{2Y} = H_L - m_3 \quad (6)$$

$$|H_x| \leqq H_{1x} = H_L - m_2 \quad (7)$$

9. A method for providing an optimized write current in a magnetic memory, the method comprising:

providing a plurality of bit lines;

providing a plurality of word lines crossing the bit lines;

providing a plurality of magnetic memory elements disposed at intersections of the bit lines and the word lines, each of the magnetic memory elements comprising a free layer with reversible magnetization and a pinned layer with fixed magnetization;

providing a reference potential generating circuit configured to generate a predetermined reference potential;

providing a write bit line current controlling circuit configured to control write bit line current passing through the bit lines in a write operation on the basis of a reference potential generated by the reference potential generating means; and

providing a write word line current controlling circuit configured to control write word line current passing through the word lines in the write operation on the basis of a reference potential generated by the reference potential generating circuit.

10. The method of Claim 9, wherein the write word line current is determined by:

determining a distance r_B from the bit lines to the free layers, a distance r_W from the word lines to the free layers, and a number n of the bit lines through which write bit line current I_B passes in a write operation; and

determining the write bit line current I_B and the write word line current I_W so as to minimize the write current I_T by using expression (1) representing an asteroid curve expressed by a bit line magnetic field H_x generated by the bit line current I_B, a word line magnetic field H_y generated by the write word line current I_W passing through the word lines in the write operation, and a predetermined constant H_K, expression (2) representing write current I_T obtained by adding the write bit line current I_B and the write word line current I_W, expression (3) representing the bit line magnetic field H_x generated by the bit line current I_B by using a predetermined coefficient a, and expression (4) representing the word line magnetic field H_y generated by the word line current I_W by using the predetermined coefficient a:

$$H_x^{\frac{2}{3}}+H_y^{\frac{2}{3}}=H_k^{\frac{2}{3}} \quad (1)$$

$$I_T= n\ I_B+ I_W \quad (2)$$

$$H_x= a\frac{I_B}{r_B} \quad (3)$$

$$H_y = a\frac{I_W}{r_W} \quad (4)$$

11. The method of Claim 10, wherein the constant H_K is given by expression (5) using a predetermined design margin m_1 when a minimum bit line magnetic field that makes it possible to reverse the magnetization of the free layers in any one of the memory cells associated with the bit line through which the write bit line current I_B passes when $H_y = 0$ or a minimum word line magnetic field that makes it possible to reverse the magnetization of the free layers in any one of the memory cells associated with a word line through which the write word line current I_W passes when $H_x = 0$ is denoted as H_U where:

$$H_K = H_U + m_1 \quad (5)$$

12. The method of Claim 9, wherein the bit line magnetic field H_x and the word line magnetic field H_y are given by expressions (6) and (7) using predetermined design

margins m_2 and m_3, respectively, when a maximum bit line magnetic field that makes it impossible to reverse the magnetization of the free layers in any one of the memory cells when $H_y = 0$ or a maximum word line magnetic field that makes it impossible to reverse the magnetization of the free layers in any one of the memory cells when $H_x = 0$ is denoted as H_L:

$$|H_x| \leqq H_{1x} = H_L - m_2 \quad (6)$$

$$|H_y| \leqq H_{2Y} = H_L - m_3 \quad (7)$$

13. A method for optimizing write current in a magnetic memory comprising a plurality of bit lines, a plurality of word lines crossing the bit lines, and a plurality of memory cells disposed at intersections of the bit lines and the word lines, each of the memory cells comprising a free layer with reversible magnetization and a pinned layer with fixed magnetization, the method comprising:

determining a distance r_B from the bit lines to the free layers, a distance r_W from the word lines to the free layers, and a number n of the bit lines through which write bit line current I_B passes in a write operation; and

determining the write bit line current I_B and the write word line current I_W so as to minimize the write current I_T by using expression (1) representing an asteroid curve expressed by a bit line magnetic field H_x generated by the bit line current I_B, a word line magnetic field H_y generated by the write word line current I_W passing through the word lines in the write operation, and a predetermined constant H_K, expression (2) representing write current I_T obtained by adding the write bit line current I_B and the write word line current I_W, expression (3) representing the bit line magnetic field H_x generated by the bit line current I_B by using a predetermined coefficient a, and expression (4) representing the word line magnetic field H_y generated by the word line current I_W by using the predetermined coefficient a:

$$H_x^{\frac{2}{3}}+H_y^{\frac{2}{3}}=H_k^{\frac{2}{3}} \quad (1)$$

$$I_T=n\ I_B+I_W \quad (2)$$

$$H_x=a\frac{I_B}{r_B} \quad (3)$$

$$H_y=a\frac{I_W}{r_W} \quad (4)$$

14. The method of Claim 13, wherein the constant H_K is given by expression (5) using a predetermined design margin m_1 when a minimum bit line magnetic field that makes it possible to reverse the magnetization of the free layers in any one of the memory cells associated with the bit line through which the write bit line current I_B passes when $H_y = 0$ or a minimum word line magnetic field that makes it possible to reverse the magnetization of the free layers in any one of the memory cells associated with a word line through which the write word line current I_W passes when $H_x = 0$ is denoted as H_U:

$$H_K = H_U + m_1 \quad (5)$$

15. The method of Claim 13, wherein the bit line magnetic field H_x and the word line magnetic field H_y are given by expressions (6) and (7) using predetermined design margins m_2 and m_3, respectively, when a maximum bit line magnetic field that makes it impossible to reverse the magnetization of the free layers in any one of the memory cells when $H_y = 0$ or a maximum word line magnetic field that makes it impossible to reverse the magnetization of the free layers in any one of the memory cells when $H_x = 0$ is denoted as H_L:

$$|H_X| \leqq H_{1X} = H_L - m_2 \quad (6)$$

$$|H_y| \leqq H_{2Y} = H_L - m_3 \quad (7)$$

16. A method of determining a write line current value comprising:

Considering asteroid curves representing bit line magnetic fields H_x generated by write bit line current I_B and word line magnetic fields H_y generated by write word line current I_w for magnetization;

defining an asteroid curve AC_{out} outside the asteroid curves of all memory cells taking manufacture variations and design margins into account; and

selecting a write bit line current and a write word line current such that the write current obtained by adding the write bit line current and the write word line current is minimized.

17. The method of claim 16, further comprising selecting the write bit line current and the write word line current such that they generate a synthetic magnetic field on the curve between calculated points of the asteroid curve Ac_{out}.

18. The method of claim 16, wherein the a magnetic memory comprises a plurality of bit lines, a plurality of word lines crossing the bit lines, and a plurality of memory cells disposed at intersections of the bit lines and the word lines, each of the memory cells comprising a free layer with reversible magnetization and a pinned layer with fixed magnetization, and wherein selecting a write bit line current and a write word line current further comprises:

determining a distance r_B from the bit lines to the free layers, a distance r_W from the word lines to the free layers, and a number n of the bit lines through which write bit line current I_B passes in a write operation; and

determining the write bit line current I_B and the write word line current I_W so as to minimize the write current I_T by using expression (1) representing an asteroid curve expressed by a bit line magnetic field H_x generated by the bit line current I_B, a word line magnetic field H_y generated by the write word line current I_W passing through the word lines in the write operation, and a predetermined constant H_K, expression (2) representing write current I_T obtained by adding the write bit line current I_B and the write word line current I_W, expression (3) representing the bit line magnetic field H_x generated by the bit line current I_B by using a predetermined coefficient a, and expression (4) representing the word line magnetic field H_y generated by the word line current I_W by using the predetermined coefficient a:

$$H_x^{\frac{2}{3}}+H_y^{\frac{2}{3}}=H_k^{\frac{2}{3}} \quad (1)$$

$$I_T=n\ I_B+I_W \quad (2)$$

$$H_x=a\frac{I_B}{r_B} \quad (3)$$

$$H_y=a\frac{I_W}{r_W} \quad (4)$$

19. The method of Claim 18, wherein the constant H_K is given by expression (5) using a predetermined design margin m_1 when a minimum bit line magnetic field that makes it possible to reverse the magnetization of the free layers in any one of the memory cells associated with the bit line through which the write bit line current I_B passes when $H_y = 0$ or a minimum word line magnetic field that makes it possible to reverse the magnetization of the free layers in any one of the memory cells associated with a word line through which the write word line current I_W passes when $H_x = 0$ is denoted as H_U:

$$H_K = H_U + m_1 \quad (5)$$

20. The method of Claim 18, wherein the bit line magnetic field H_x and the word line magnetic field H_y are given by expressions (6) and (7) using predetermined design margins m_2 and m_3, respectively, when a maximum bit line magnetic field that makes it impossible to reverse the magnetization of the free layers in any one of the memory cells when $H_y = 0$ or a maximum word line magnetic field that makes it impossible to reverse the magnetization of the free layers in any one of the memory cells when $H_x = 0$ is denoted as H_L:

$$|H_X| \leqq H_{1X} = H_L - m_2 \quad (6)$$

$$|H_y| \leqq H_{2Y} = H_L - m_3 \quad (7)$$